

### **REMARKS**

Reconsideration of this application, based on this amendment and these following remarks, is respectfully requested.

Claims 1 through 25 and 27 through 31 remain in this case. Claims 1, 10, 11, 21, 23, and 31 are amended.

The undersigned appreciates the attention that the Examiner gave to the Request for Reconsideration filed October 10, 2006. Such attention to a response after a final rejection is very welcome.

Claims 1, 3, 4, 6, 7, 10, 11, 15, 21, 23, 27, and 28 were provisionally rejected under the judicially created doctrine of double patenting of the obviousness type, as being unpatentable over claims 1, 3, and 10 of copending application S.N. 10/678,893.

Applicants traverse the provisional rejection, on the grounds that the Examiner has failed to establish a *prima facie* case of obviousness between the claims. As stated in the Office Action, claim 1 in this application recites the dividing of a page in a non-volatile memory into at least two segments, performing ECC calculations according to a first ECC algorithm to encode data for a first segment, and performing ECC calculations according to a second ECC algorithm to encode the data for a second segment. Claim 1 of application S.N. 10/678,893 was cited as claiming the encoding of data for a block of a non-volatile memory according to a first ECC algorithm if an indicator for a block meets a criterion, and encoding the data according to a second ECC algorithm if the indicator does not meet the criterion. The claims differ from one another in that claim 1 in this application refers to encoding different segments within a page (a page being a constituent of a block in a non-volatile memory) according to different algorithms, while claim 1 in application S.N. 10/678,893 refers to encoding data for a block according to a selected ECC algorithm based on an indicator.

But nowhere does the Examiner assert that this difference between the claims is an unpatentable difference, nor does the Examiner apply the proper §103 analysis. The Examiner offers no reason why this difference, or any difference, between the claims is suggested by the prior art, or otherwise obvious to a person of ordinary skill in the art. Rather, the Examiner merely concludes that “[b]oth describe applying a first ECC algorithm to a first segment and a second ECC algorithm to a second segment of a non-volatile memory”.<sup>1</sup> Besides being inaccurate<sup>2</sup>, this statement is completely inadequate to meet the standards for drawing a conclusion of obviousness. The rejection of the other claims is similarly inadequate.

Applicants therefore respectfully submit that the Examiner has failed to establish a *prima facie* case that the claims in this case are obvious variants of the claims in S.N. 10/678,893. Accordingly, Applicants submit that the provisional double patenting rejection of the obviousness type is in error, and respectfully traverse that basis of rejection. Reconsideration is requested.

Claims 1 through 3, 6 through 9, 11 through 14, 17 through 20, 22 through 25, and 27 through 30 were rejected under §103 as unpatentable over the Smith reference<sup>3</sup> in view of the Bassett et al. reference<sup>4</sup>. Claims 4, 5, 15, 16, and 26 were rejected under §103 as unpatentable over the Smith and Bassett et al. references, further in view of the Zhang et al. reference<sup>5</sup>. Claims 10, 21, and 31 were rejected under §103 as unpatentable over the Smith and Bassett et al. references, further in view of the Kramer reference<sup>6</sup>.

Regarding claim 1, the Examiner found that the Smith reference teaches all elements of the claim, in its previous form, except for use of different ECC algorithms for different segments. The Examiner found, however, that the Bassett et al. reference discloses the applying of different error correcting codes of different strengths to different sectors within a memory storage device,

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<sup>1</sup> Office Action of October 20, 2006, page 6.

<sup>2</sup> Nothing in claim 1 of S.N. 10/678,893 requires that the memory actually be written with portions encoded according to both ECC algorithms. For example, if all indicators for all blocks meet the criterion, only the first ECC algorithm will be used.

<sup>3</sup> U.S. Patent No. 6,961,890 B2, issued November 1, 2005 to Smith, from an application filed August 16, 2001.

<sup>4</sup> U.S. Patent No. 6,747,827 B1, issued June 8, 2004 to Bassett et al., from an application filed March 27, 2000.

<sup>5</sup> U.S. Patent No. 6,662,333, issued December 9, 2003 to Zhang et al., on an application filed February 4, 2000.

with the selection made for various reasons, including the physical location on the disk drive and also the type of data being stored.<sup>7</sup> The Examiner further asserted that one skilled in the art would have been motivated to modify the Smith device according to the teachings of the Bassett et al. reference to save memory space, by reducing the number of ECC bits that need be associated with at least some of the data.<sup>8</sup> Claim 1 was rejected accordingly.

Claim 1 is amended to clarify its patentability over the prior art. Amended claim 1 now recites that the non-volatile memory is a “flash” memory, and that a page is the smallest unit of programming in the flash memory.<sup>9</sup> The claim is further clarified by reciting the dividing of the page into segments, the encoding of data associated with the first and second segments, and by adding an express step of programming the page with the encoded data associated with the first and second segments.<sup>10</sup> Considering the clear support in the specification for this amendment to claim 1, no new matter is presented by this amendment.

Claim 10 is amended for consistency with the amendment to claim 1.

Applicants submit that amended claim 1 and its dependent claims are patentably distinct over the proper combination of the Smith and Bassett et al. references, and over the other prior art of record, on the grounds that there is no suggestion to combine the Bassett et al. and Smith references in such a manner as to reach the requirements of claim 1.

As discussed above, claim 1 is clarified to be more specifically directed to a non-volatile flash memory, and more specifically recites that the smallest unit of programming in this flash memory is the element that is divided into segments.

The Smith reference teaches the dividing of a data structure in a non-volatile memory into payload and redundancy portions, with the “divider” between those portions movable

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<sup>6</sup> U.S. Patent No. 6,182,239, issued January 30, 2001 to Kramer.

<sup>7</sup> Office Action of October 20, 2006, pages 7 through 10.

<sup>8</sup> Office Action, *supra*, page 11.

<sup>9</sup> See specification of S.N. 10/679,000, as published as U.S. Patent Application Publication No. US 2004/0083334 A1, published April 29, 2004, paragraph [0044].

<sup>10</sup> Specification, *supra*, paragraph [0032], [0044].

depending on the desired error correction code.<sup>11</sup> However, as admitted by the Examiner, there is no teaching in the Smith reference regarding the use of different ECC codes for any different portions of a “data structure” in the Smith reference. Indeed, considering that the only dividing taught by the reference<sup>12</sup> is this dividing between payload and redundancy portions, one wonders how these two portions could possibly be encoded according to different ECC algorithms, considering that the redundancy portion is *the result of* ECC encoding of the payload portion. This wonder is especially well-placed, relative to the Smith reference, considering its express teachings that the selection of its error rate is based on a “fundamental error rate” for a given memory device, considered as a whole; while the reference discloses multiple “dividers” representing the error correcting codes of different weight, these alternative dividers “are alternatives to the first divider 206, and [ ] only one divider may be used at a given time”.<sup>13</sup> The skilled reader therefore will read the Smith reference as teaching the use of a single ECC algorithm of selected strength over the entire memory, with the payload stored in the payload portion of the data structure, and the redundant bits from that selected ECC algorithm stored in the “redundancy” portion.

It is beyond the pale to assert that one could possibly be motivated to modify the Smith teachings to then, again, encode the redundant ECC bits from the encoding of the payload, much less to encode these redundant ECC bits with a different algorithm. And, indeed, the Bassett et al. reference certainly does not provide any such suggestion. The Bassett et al. reference is directed to the encoding of data stored on a disk drive, where different sectors may be encoded with different ECC algorithms.<sup>14</sup> But these teachings, besides being directed to a disk drive rather than a non-volatile flash memory, simply provide no suggestion to encode the two portions of the Smith data structure with different ECC algorithms, especially where one portion (the “redundant” portion) is the result of ECC encoding of the other portion (the “payload”).

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<sup>11</sup> Smith, *supra*, column 4, lines 16 through 64.

<sup>12</sup> And asserted by the Examiner.

<sup>13</sup> *Id.*, at column 4, lines 29 through 31.

<sup>14</sup> Bassett et al., *supra*, column 4, line 29 through column 5, line 37.

Applicants therefore respectfully submit that the Smith and Bassett et al. references cannot, and would not, be combined in the manner asserted by the Examiner in rejecting claim 1 in this application. Nor do the other references, specifically the Zhang et al. and Kramer references, provide any teachings in this regard. Applicants therefore submit that the rejection of claim 1 and its dependent claims is necessarily based on the hindsight application of their own teachings, and is therefore in error.

Furthermore, Applicants submit that amended claim 1 is even further patentably distinct over this combination of references. Amended claim 1 now expressly recites that the first and second segments, which store data encoded according to the first and second ECC algorithms, respectively, are within the same page of the non-volatile flash memory, where a page is the smallest programming unit of the memory. The combined teachings of the Smith and Bassett et al. reference simply cannot reach this limitation. As discussed above, the Smith data structure is divided into payload and redundancy portions, and the Bassett et al. reference is directed to a disk drive system. The Bassett et al. teachings provide no insight or hint into how one might have multiple segments, encoded with different algorithms, within a single flash memory page, and therefore provide no motivation to modify the Smith reference in order to arrive at a method of storing data in connection with such multiple segments, as recited in amended claim 1 and its dependent claims. Nor do the other references provide such motivation or suggestion. The combined teachings of the references therefore fall far short of the requirements of amended claim 1 and its dependent claims.

For these reasons, Applicants submit that amended claim 1 and its dependent claims are patentably distinct over the prior art applied against the claims.

Claim 11 is similarly amended to clarify its patentable distinctiveness over the prior art. Amended claim 11 is directed to a memory system comprising a non-volatile flash memory, the memory including a page, recited as the smallest unit of programming in the flash memory, and that code devices are for encoding data associated with first and second segments of the page, according to first and second ECC algorithms, respectively. Amended claim 11 also now requires, *inter alia*, code devices for programming the page with the encoded data associated

with the first and second segments of the page.<sup>15</sup> As discussed above relative to amended claim 1, no new matter is presented by this amendment to claim 11, considering the clear support in the specification.

Claim 21 is amended for consistency with the amendment to claim 11.

Applicants submit that the previous rejection of claim 11 and its dependent claims was in error, and that amended claim 11 and its dependent claims are in fact patentably distinct over the prior art of record in this case.

As discussed above relative to claim 1, the Smith reference teaches a data structure in a non-volatile memory that has payload and redundancy portions of sizes, relative to one another, that depend upon the selected error correction code.<sup>16</sup> The Examiner admitted that the Smith reference fails to disclose using different ECC codes for different portions of this “data structure”, and the reference in fact fails to disclose that feature. But because the reference teaches the dividing of a data structure only between payload and redundancy portions, Applicants question how (and more importantly why) the skilled reader could (or would) encode these two portions using different ECC algorithms, considering that the contents of the redundancy portion *result from* the ECC encoding of the payload portion. And because the Smith reference teaches only the use of a single ECC algorithm of selected strength over the entire memory,<sup>17</sup> the skilled reader therefore will comprehend, from this reference, that such encoding will result only in the payload stored in the payload portion of the data structure, and the redundant bits from that selected ECC algorithm stored in the “redundancy” portion. There is exactly no reason why the skilled reader would possibly be motivated to again separately encode the redundant ECC bits, resulting from the encoding of the payload – such encoding would result in even more redundant bits, redundant to the redundant bits from the first encoding, much less according to a different algorithm.

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<sup>15</sup> Specification, *supra*, paragraph [0063].

<sup>16</sup> Smith, *supra*, column 4, lines 16 through 64.

<sup>17</sup> *Id.*, at column 4, lines 29 through 31.

The Bassett et al. reference certainly provides no motivation or suggestion to do this. Rather, the Bassett et al. reference is directed to the encoding of data stored on a disk drive, where different sectors may be encoded with different ECC algorithms.<sup>18</sup> Even if one (improperly) ignores the substantial difference between the disk drive of the reference and the non-volatile flash memory of claim 11, the reference simply provides no suggestion to encode the two portions of the Smith data structure with different ECC algorithms, especially where one portion (the “redundant” portion) is already the result of ECC encoding of the other portion (the “payload”). Nor do the other references, specifically the Zhang et al. and Kramer references, provide any teachings in this regard.

Applicants therefore respectfully submit that the Smith and Bassett et al. references cannot, and would not, be combined in the manner asserted by the Examiner in rejecting claim 11 in this application. Applicants therefore submit that the rejection of claim 11 and its dependent claims is necessarily based on the hindsight application of their own teachings. Withdrawal of the rejection is requested.

Applicants further submit that amended claim 11 is even further patentably distinct over this combination of references. Amended claim 11 now expressly recites that the first and second segments, into which the data encoded according to the first and second ECC algorithms, respectively, are programmed, are within the same page, or smallest programming unit of the memory, of the non-volatile flash memory of the claimed system. The combined teachings of the Smith and Bassett et al. reference simply cannot reach this limitation of the claim. As discussed above, the Smith reference teaches a divided data structure having payload and redundancy portions, while the Bassett et al. reference is directed to encoding in a disk drive system. While the Bassett et al. reference mentions using different ECC algorithms for different data types, these teachings provide no insight or hint into how or why one would program data into multiple segments of a single flash memory page, where that data is encoded with different algorithms. The reference therefore provides no suggestion or motivation to the skilled reader to modify the Smith reference in order to arrive at the system recited in amended claim 11 and its

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<sup>18</sup> Bassett et al., *supra*, column 4, line 29 through column 5, line 37.

dependent claims. Nor do the other references provide such motivation or suggestion. The combined teachings of the references therefore fall far short of the requirements of amended claim 11 and its dependent claims.

For these reasons, Applicants submit that amended claim 11 and its dependent claims are also patentably distinct over the prior art applied against the claims.

Claim 23 is also amended to clarify its distinction over the prior art, by now reciting that its memory system comprises a non-volatile flash memory having a page, the page being the smallest unit of programming in the non-volatile flash memory. The claimed system now also recites means that encode data associated with first and second segments of the page according to first and second ECC algorithms, respectively, and now also includes means for programming the page with the encoded data associated with those first and second segments. No new matter is presented by this amendment, as discussed above relative to claims 1 and 11.

Claim 31 is amended for consistency with the amendment to claim 23.

Applicants submit that the previous rejection of claim 23 and its dependent claims was in error, and that amended claim 23 and its dependent claims are patentably distinct over the prior art of record in this case.

As discussed above relative to claims 1 and 11, to the extent that the Smith reference teaches dividing a data structure in a non-volatile memory, those teachings are only that this data structure is divided into payload and redundancy portions, with the relative sizes of these portions depending on the selected error correction code.<sup>19</sup> Applicants agree with the Examiner that the Smith reference fails to disclose using different ECC codes for different portions of this “data structure”. But because of the limited stated purpose for the dividing of the data structure, as only between payload and redundancy portions, Applicants submit that there is no reason why the skilled reader of the Smith reference would use these two portions using different ECC algorithms, nor is there any suggestion of how that encoding could be done even if the thought

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<sup>19</sup> Smith, *supra*, column 4, lines 16 through 64.



occurred. Because the contents of the redundancy portion *necessarily result from* the ECC encoding of the payload portion, the reference provides no reason why those redundant bits would be again separately encoded, much less according to a different algorithm.

The other prior art of record lacks any suggestion or motivation to modify the Smith reference in this manner. The Bassett et al. reference is directed to the encoding of data stored on a disk drive, where different sectors may be encoded with different ECC algorithms,<sup>20</sup> and as such it provides no suggestion to encode the two portions of the Smith data structure with different ECC algorithms, especially where one portion (the “redundant” portion) is already the result of ECC encoding of the other portion (the “payload”). Nor do the other references, specifically the Zhang et al. and Kramer references, provide any teachings in this regard.

Absent such suggestion or motivation, Applicants submit that the rejection of claim 23 and its dependent claims is necessarily based on the hindsight application of their own teachings. Withdrawal of the rejection is requested.

Applicants further submit that amended claim 23 is even further patentably distinct over this combination of references. Amended claim 23 now expressly recites that the page containing the first and second segments, into which the data encoded according to the first and second ECC algorithms, respectively, are programmed, is the smallest programming unit of the memory of the non-volatile flash memory of the claimed system. The combined teachings of the Smith and Bassett et al. reference simply cannot reach this limitation of the claim. While the Bassett et al. reference mentions using different ECC algorithms for different data types, these teachings provide no insight or hint into how or why one would program data into multiple segments of a single flash memory page, especially the payload and redundancy portions of the data structure of the Smith reference, where that data is encoded with different algorithms. These references, as well as the other references of record, therefore provide no suggestion or motivation to the skilled reader to modify the Smith reference in order to arrive at the system recited in amended claim 23 and its dependent claims. The combined teachings of the references

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<sup>20</sup> Bassett et al., *supra*, column 4, line 29 through column 5, line 37.

therefore fall far short of the requirements of amended claim 23 and its dependent claims, and motivation to modify these teachings to reach claim 23 is absent from the prior art.

For these reasons, Applicants submit that amended claim 23 and its dependent claims are also patentably distinct over the prior art applied against the claims.

For the above reasons, Applicants respectfully submit that all claims now in this case are in condition for allowance. Reconsideration of this application is therefore respectfully requested.

Respectfully submitted,

/Rodney M. Anderson/

Rodney M. Anderson

Registry No. 31,939

Attorney for Applicants

Anderson, Levine & Lintel, L.L.P.

14785 Preston Road, Suite 650

Dallas, Texas 75254

(972) 664-9554